

Sanyo Utility model (full translation)

Application No: 4- 75287(filed on Oct.29, 1992)

Status: Unexamined

Claim:

A battery pack having plural batteries with a switching element which comprises two terminals and a PTC element placed between the two terminals, wherein the switching element is placed over two adjacent batteries, one terminal (terminal I) is attached to the button terminal of one battery and the other terminal (terminal II) is attached to the planer terminal of the other battery, is characterized that

- the terminal I has a cap portion with a little larger diameter than the button terminal to cover the button terminal, and
- the PTC element has a hole with a little larger diameter than the cap portion so that the cap portion can be inserted into the hole.

Specification:

This utility model relates to an improvement of how to install a PTC device to a battery pack.

[prior art]

Many variety of batteries like a Ni-Cd battery, Ni-H battery and Li battery have been used. Battery packs each of which has plural batteries have also been used in various fields like video camera, computer, communication, camera, electrical equipment and analytical equipment. In such applications it is necessary to have a protection for these battery packs in case of short circuit. Some battery packs already have PTC devices as protection devices. In such case, as shown in Fig.7 and Fig.8, PTC element 100 in a square form has two lead terminals 101 and 102 each of which is attached to ends 103 and 104 of two adjacent batteries respectively. Insulations 105 and 106 are used to cover these terminals 101 and 102.

[subject to be solved]

The subject to be solved of this utility model is to downsize battery packs. Current battery packs need enough height to contain the total thickness of the insulations 105 and 106, and the PTC element 100 as shown in Fig.8. This gives some difficulties for downsizing battery packs.

[solution]

In order to solve the subject, a battery pack having plural batteries with a switching element which comprises two terminals and a PTC element placed between the two terminals, wherein the switching element is placed over two adjacent batteries, one terminal (terminal (I)) is attached to the button terminal of one battery and the other terminal (terminal (II)) is attached to the planer terminal of the other battery, is characterized that

- the terminal (I) has a cap portion with a little larger diameter than the button terminal to cover the button terminal, and
- the PTC element has a hole with a little larger diameter than the cap portion so that the cap portion can be inserted into the hole.

[effectiveness]

In this structure, the height of a button terminal around which there used to be dead space can include the thickness of a PTC element, because the cap of terminal (I) covers the button terminal and the cap goes into the hole of the PTC element. The height of a battery pack of this structure becomes almost same height as each battery. It is also easy to place a switching element which comprises a PTC element and two terminals to a battery, because it is just for the cap of terminal (I) to cover the button terminal.

[example]

An example is shown according to from Fig.1 to 6.

Fig.1 shows switching element 1 comprising terminals (I) and (II), 2 and 4 in Fig.1, respectively, and PTC element 3.

Terminal (I) 2 is circular and has cap 2a in a shape of convex in the center of it. Terminal (I)2 can easily cover button terminal 9a of battery 9 by cap 2a, because inside diameter L1 of cap 2a is a little bigger than diameter L2 of button terminal 9a of battery 9.

Terminal (II)4 consists of two connecting portions 4a and 4b. While connecting portion 4a is incompletely circular and attached to PTC element 3, connecting portion 4b extends from the periphery of connecting portion 4a and is attached to minus terminal 10a of adjacent battery 10 as shown in Fig.4.

In Fig.4 and Fig.5, switching element 1 is attached between center two batteries 9 and 10 among four batteries 8~11 in series connection. Batteries 8 and 10 are connected to batteries 9 and 11 respectively by connecting tabs 12 and 13. Batteries 8 and 11 also have outer terminals 14 and 15. Each of batteries 8~11 is covered by a heat shrinkable tube 16 except its terminals and four covered batteries are held together by tape 17. Furthermore a set of four batteries, switching element 1, connecting

tabs 12 and 13, and a part of outer terminals 14 and 15 are covered by tube 18 to avoid a short circuit.

Fig 6 shows insulation ring 20 between terminal (I) 2 and battery 9.

Here is an explanation of how to make a battery pack with this structure.

After cap 2a of terminal (I)2 is inserted into hole 3a of PTC element 3, terminal (I) 2 is attached to one side of PTC element 3 as well as terminal (II)4 is attached to the other side by electrical welding to make switching element 1. After each of batteries 8~11 is covered by a heat shrinkable tube 16, the four batteries are placed so that adjacent two terminals are in alternate alignment. Then the four batteries are held together by tape 17. After insulation ring 20 and terminal (I) 2 of switching element 1 are placed to cover battery 9 button terminal, terminal (I) 2 and the button terminal as well as battery 10 minus terminal and terminal(II) 4 are electrically welded. Connecting tabs 12 and 13 are electrically welded to between the battery 8 plus terminal and battery 9 minus terminal as well as between battery 10 plus terminal and battery 11 minus terminal. Outer terminals 14 and 15 are also electrically welded to battery 8 minus terminal and battery 11 plus terminal respectively. Then batteries 8~11 and switching element 1 are covered by tube 18.

In such structure, battery 9 plus terminal is covered by cap 2a of terminal (I) 2 which is shorter than the height of the button terminal. Cap 2a is inserted in to PTC element 3 thickness of which is almost same as height L6 of cap 2a. As shown in Fig.2, since the height of a plus terminal around which there used to be dead space can include the thickness of a PTC element, the height of a battery pack with this structure becomes almost same as the height of each battery.

In addition, it is also easy to place a switching element comprising a PTC element correctly, because it is just for cap 2a of terminal (I) 2 to cover plus terminal 9a of battery 9.

There is no limitation for terminal structure of switching element. As far as connecting portion 4a doesn't make any contact with terminal (I)2, it can be a ring, T shape or Y shape. There is also no limitation for a method to attach PTC element 3 to terminals 2 and 4. Soldering may be applied.

[advantage of this utility model]

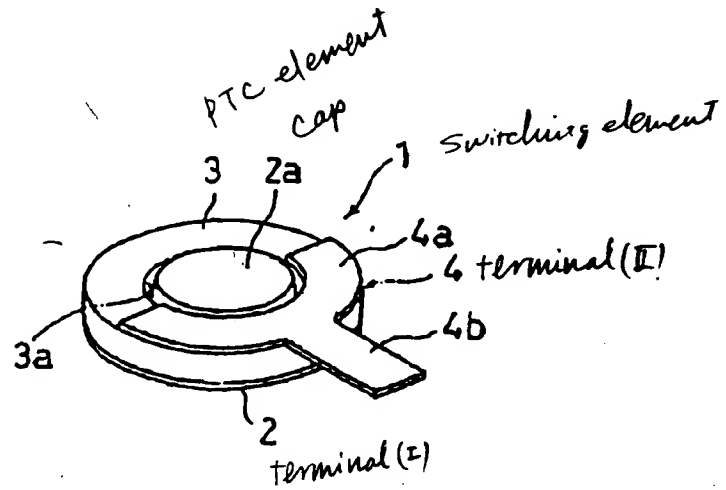
Since the height of a button terminal around which there used to be dead space can include the thickness of a PTC element, the height of a battery pack with this structure becomes almost same as the height of each battery. It will be possible to downsize battery packs further. It is also easy to place a switching element which comprises a PTC element and two terminals to a battery, because it is just for the cap

portion of terminal(I) to cover a battery button terminal. It will also make production process of battery packs easier.

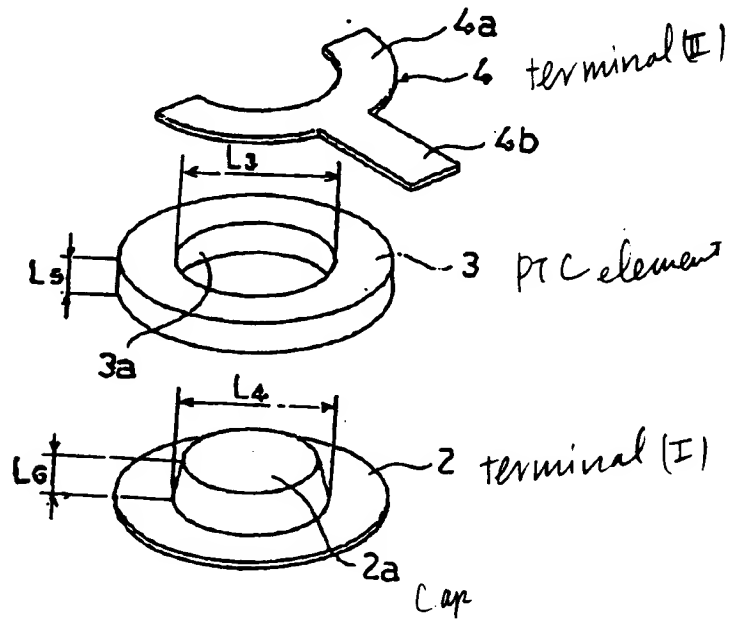
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【書類名】 図面

【図1】



【図2】

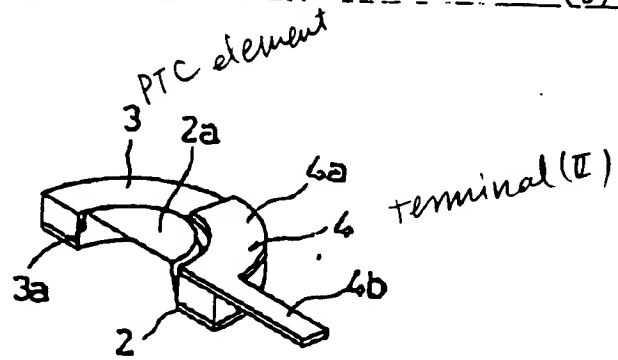


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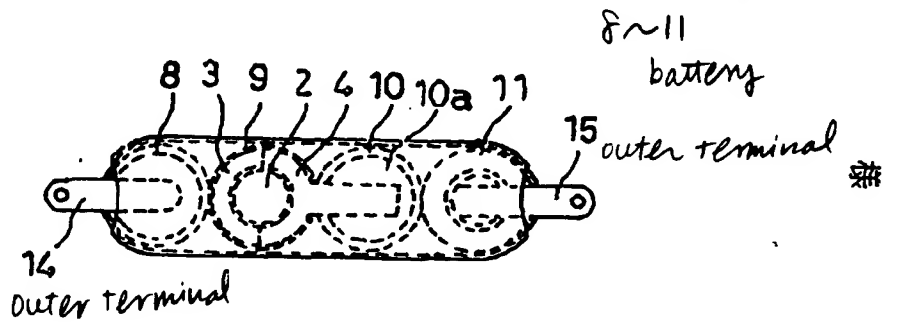
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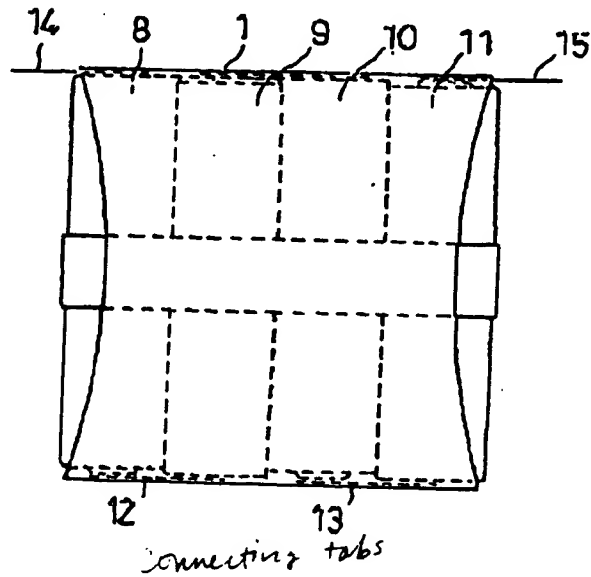
【図3】



【図4】



【図5】

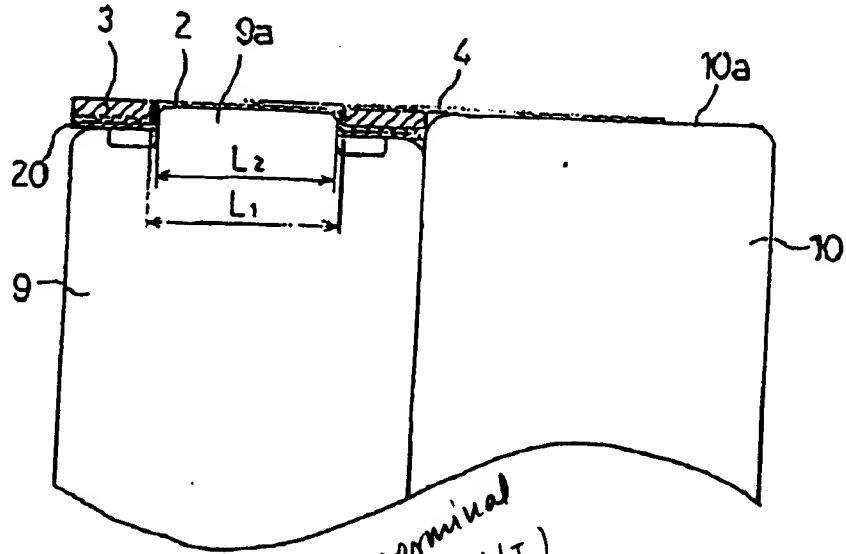


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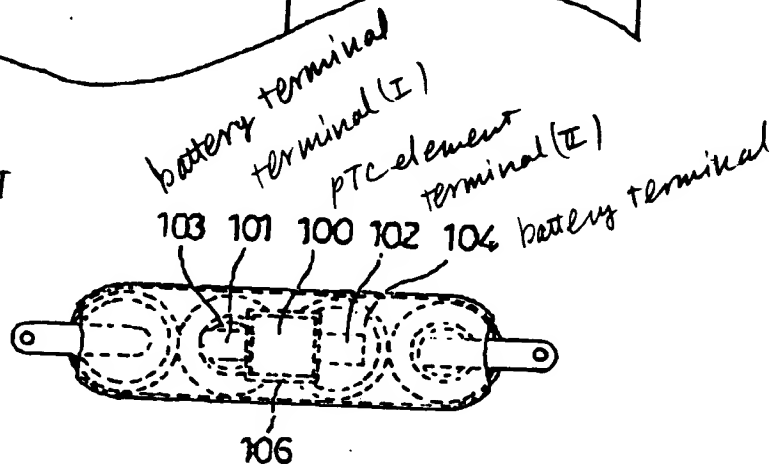
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【図6】



【図7】

prior art



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【図8】

prior art

